

# PATENT SPECIFICATION

NO DRAWINGS

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L158,471



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Date of filing Complete Specification: 12 July, 1967.

Application Date: 22 July, 1966.

No. 33069/66.

Complete Specification Published: 16 July, 1969.

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Index at acceptance: —B6 JA2

Int. Cl.: —B 29 c 15/00

## COMPLETE SPECIFICATION

### Embossed Thermoplastic Sheet Material

We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, Imperial Chemical House, Millbank, London S.W.1, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method for producing embossed thermoplastic sheet material and in particular thermoplastic sheet material having an embossed pattern in the form of a multiplicity of closely spread protuberances resembling suede.

Embossing surfaces used for producing an embossed pattern on thermoplastic sheet materials have a surface pattern which is the reverse of the design required on the plastic sheet. When the embossing surface is impressed on the surface of the thermoplastic sheet, with appropriate conditions of heat and pressure, the hills and valleys of the pattern become the valleys and hills respectively in the plastic sheet. Normally such embossing surfaces have been metallic.

It is well known in the art that when the embossed design is very fine difficulties in producing a satisfactory product are twofold. Firstly, the embossing surface itself is very difficult and expensive to produce and, secondly, great difficulty is experienced in separating the embossed plastic sheet from the embossing surface after the completion of the embossing operation. Recently, embossing surfaces having an embossed pattern in the form of closely spaced surface holes or indentations have been successfully made in such metals as nickel and lead. However, the second difficulty has remained in that it has been difficult to remove the embossed plastic sheet from such embossing surfaces without damage to the embossed pattern.

[Price 4s. 6d.]

In particular when the metal embossing surfaces used has a surface pattern comprising a multiplicity of surface indentations having a depth in excess of 0.002 inch and a surface density in excess of 400 indentations per square inch any plastic sheet embossed by it cannot be readily removed from the embossing surface without damage to the embossed pattern formed on the sheet. It will be realised that the pattern formed on the sheet will be in the form of a number of protuberances and during removal from the embossing surface the likelihood of one or more protuberances being broken off is great.

In Specification No. 1,003,701, we have disclosed a method which is suitable for the production of plastic sheet material having a surface pattern in the form of a multiplicity of ciliary fibres. The method disclosed here consisted of casting a paste of a thermoplastic material on to the patterned surface of a band made from an organo-polysiloxane. On account of no pressure being exerted during the casting process no distortion of the surface pattern takes place and a perfect reproduction is obtained.

We have now surprisingly found that a suede-like thermoplastic sheet material can be produced by embossing a sheet of the material with an embossing surface made from a suitable silicone elastomer.

In accordance with the present invention a method of producing a suede-like material comprises heating a sheet of a thermoplastic material to render its surface plastic, impressing the surface of the thermoplastic material with an embossing surface having a surface pattern consisting of a multiplicity of surface indentations having a depth in excess of 0.002 inch and a surface density in excess of 400 indentations per square inch, the em-

bossing surface being made from a silicone elastomer having a Youngs Modulus selected from the range 250 to 1000 pounds per square inch, and separating the embossed plastic sheet from the embossing surface.

With our invention the embossed sheet can readily be removed from the embossing surface because each individual indentation in the surface can distort sufficiently to allow each embossed protuberance on the sheet to be removed without damage. However, on the other hand, during the embossing operation the individual indentations retain their configuration sufficiently well to produce an almost perfect reproduction of the pattern on the embossing surface.

The embossing surface used in our invention may be the surface of a plate or roller, either of which may optionally be provided with a metal or other suitable support.

Preferably our invention is performed using a pressure selected in the range 10 pounds to 1000 pounds per square inch.

The heat required will be such that at least the surface of the sheet material is softened and rendered receptive to embossing by the embossing surface when pressure is applied. The temperature to which the sheet will have to be heated will be dependent on the nature of the sheet material. With the usual thermoplastic materials employed in the art, examples of which are vinyl polymers and copolymers, a temperature can be selected in the range 80°C—200°C. The sheet material may be preheated, e.g. by infra red radiation or by contact with a hot platen.

Optionally the thermoplastic sheet material we use may be provided with a supporting substrate.

In one form of the present invention the suede-like material produced is further provided with a coating of a hard resinous compound, for example a coating of a polymer of methyl methacrylate, the purpose of this coating being to combat stickiness and enhance the surface appearance of the product.

Because of the nature of the product attempts to apply the resinous coating after completion of the embossing operation have essentially produced an uneven coating, only the upper portions of the protuberances being coated. However the trade has hitherto had to accept this drawback with suede-like products. The only alternative was to apply the resin coating on to the surface of the sheet material prior to the embossing operation and this was wholly unacceptable because of excessive sticking between the resin coating and metal embossing surfaces.

We have now found that the method of the present invention is suited to the application of a resin coating on to the surface of the sheet material prior to the embossing operation.

Therefore, in accordance with a preferred form of our invention there is provided a method of producing a suede-like material which comprises providing a thermoplastic sheet material, for example a sheet of plasticised polyvinyl chloride, with a coating of a dissimilar thermoplastic material, for example a polymer of methyl methacrylate, heating the composite sheet to render it plastic, impressing the surface of the thermoplastic material with the silicone elastomer embossing surface and separating the embossed plastic sheet so formed from the embossing surface.

Also included in the present invention is a thermoplastic sheet material, optionally provided with a supporting substrate, provided on its surface with an embossed pattern consisting of a multiplicity of surface protuberances having a height in excess of 0.002 inch and a surface density in excess of 400 protuberances per square inch, made in accordance with the present invention.

Our invention is further illustrated by the following Examples.

#### EXAMPLE 1

A plastic coated fabric was prepared by calendering a 0.015 inch thick coating of a pigmented plasticised polyvinyl chloride composition on to a light weight cotton fabric. The plastic coating was gelled by the application of heat and the coated fabric so formed stored until subsequently required for use.

A piece of the material was introduced between the platens of a press. One platen, the one adjacent to the polyvinyl chloride coating, comprised a pad of a silicone elastomer having a Youngs Modulus of approximately 525 pounds per square inch. On the surface adjacent to the plastic coating the surface pattern comprised a multiplicity of conical indentations, the surface density of which was approximately 12,500 per square inch, the depth of each indentation being approximately 0.011 inch and the diameter of the base of each conical indentation being approximately 0.004 inch.

This platen was heated to about 160°C before being brought into contact with the plastic coating. A pressure of 200 pounds per square inch was maintained between the platens for about 5 secs.

The silicone elastomer pad was removed from the sheet without damage to the sheet. The sheet was now provided with a surface pattern which was a perfect reproduction of that provided on the silicone elastomer pad.

#### EXAMPLE 2

A plastic coated fabric as made in Example 1 was provided on the surface to be embossed with a coating of a lacquer based on a polymer of methyl methacrylate. The lacquer

coating was heated to cause evaporation of the solvent in it.

5 A piece of the material so formed was then subjected to the same embossing operation as outlined in Example 1.

10 The product so formed, apart from having a surface configuration which was a perfect reproduction of the pattern provided on the embossing surface, had a substantially even coating of polymethyl methacrylate over the embossed surface.

WHAT WE CLAIM IS:—

15 1. A method of producing a suede-like material comprising heating a sheet of a thermoplastic material to render its surface plastic, impressing the surface of the thermoplastic material with an embossing surface having a surface pattern consisting of a multiplicity of surface indentations having a depth in excess of 0.002 inch and a surface density in excess of 400 indentations per square inch, the embossing surface being made from a silicone elastomer having a Youngs Modulus selected from the range 25 250 to 1000 pounds per square inch, and separating the embossed plastic sheet from the embossing surface.

30 2. A method as claimed in Claim 1 in which the embossing surface is the surface of a plate.

3. A method as claimed in Claim 1 in which the embossing surface is the surface of a roller.

4. A method as claimed in any one of the preceding claims in which the thermoplastic sheet material is impressed with the embossing surface using a pressure selected in the range 10 pounds per square inch to 1000 pounds per square inch. 35

5. A method as claimed in any one of the preceding claims in which the thermoplastic sheet material is provided with a coating of a dissimilar thermoplastic material prior to impressing the coated surface with an embossing surface as defined in Claim 1. 40 45

6. A method of producing a suede-like material substantially as herein described with specific reference to either of the Examples provided.

7. A thermoplastic sheet material provided on its surface with an embossed pattern consisting of a multiplicity of surface protuberances having a height in excess of 0.002 inch and a surface density in excess of 400 protuberances per square inch, produced by the method claimed in any one of the preceding claims. 50 55

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1969.  
Published by the Patent Office, 25, Southampton Buildings, London, W.C.2. from which copies may be obtained.

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